A Prospective Longitudinal Study of Transmission of Multidrug Resistant Organisms (MDROs) between Environmental Sites and Hospitalized Patients – Interim Analysis of the TransFER Study

**Background**
Contaminated hospital surfaces may be sources for bacterial transmissions. However, the nature and efficiency of bacterial transmission between patients and surfaces in hospital rooms remain unknown. We describe the dynamics and quantity of MDRO transmission between surfaces and patients admitted into newly cleaned hospital rooms.

**Methods**
We performed a prospective cohort study enrolling patients admitted into newly-disinfected hospital rooms at a tertiary care medical center and a community hospital. Samples from patients and room surfaces were cultured and analyzed to describe the level of colonization of four MDROs (MRSA, VRE, MDR Acinetobacter, and C. difficile) at scheduled intervals during hospitalization.

**Data from 40 enrolled patient room pairs were examined in this interim analysis. At enrollment, 39 (98%) of patients were colonized and 26 (65%) rooms were contaminated with one or more of these four MDROs.** VRE and antibiotic-resistant MRSA were the most frequently detected organisms on surfaces, respectively. Forty (98%) patients had persistent colonization with the same organism throughout the hospitalization. By Day 2, 3 (6%) rooms had MDRO contamination. Of new, 12 (25%) rooms were newly contaminated while 18 (36%) rooms had residual surface contamination with organisms identified on enrollment (Day 0). There were 12 (55%) rooms were newly contaminated while 10 (45%) rooms had residual surface contamination. There were 5 (13%) of patients were colonized and 26 (65%) rooms were contaminated with one of the four MDROs (MRSA, VRE, MDR Acinetobacter and C. difficile).

**Conclusion:** Patients and surfaces in disinfected and cleaned rooms were frequently colonized with MDROs. Transmission of MDROs between patients and surfaces occurred in 10% of hospitalizations. Molecular identification and related studies are underway. Future research should study interventions to interrupt this bi-directional transmission cycle.

**Patient Specimens**
- Site: Axilla, rectum, and if available, from wounds, indwelling devices and feces.

**Environmental Specimens**
- Site: Bed Rail, Table, Counter, Bathroom, Chair Arm, Toilet Seat, Bathroom Floor, Alternate

**Results**
- In all, 30 patients were prospectively sampled.
- Surfaces were continuously sampled at 3 time points: D0, D3, D7.
- Surfaces were paired by hospital, admission location, and patient's room.
- Patient and environmental surfaces were cultured and analyzed to describe the level of colonization of 4 environmental organisms.
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- Surface contamination with organisms identified on enrolment (day 1). There were 12 (55%) rooms were newly contaminated while 10 (45%) rooms had residual surface contamination. There were 5 (13%) of patients were colonized and 26 (65%) rooms were contaminated with one of the four MDROs (MRSA, VRE, MDR Acinetobacter and C. difficile).

**Study Methods**
- **Patient Specimens**:
  - Site: Axilla, rectum, and if available, from wounds, indwelling devices and feces.
- **Environmental Specimens**:
  - Site: Bed Rail, Table, Counter, Bathroom, Chair Arm, Toilet Seat, Bathroom Floor, Alternate

**Sampled 40 patients and their terminally-cleaned rooms**

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<thead>
<tr>
<th>Patient Specimens</th>
<th>Environmental Specimens</th>
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<td>Site</td>
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<tr>
<td>Axilla</td>
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**Patient and environmental surfaces prospectively sampled**

- **Patient Specimens**:
  - Site: Axilla, rectum, and if available, from wounds, indwelling devices and feces.
- **Environmental Specimens**:
  - Site: Bed Rail, Table, Counter, Bathroom, Chair Arm, Toilet Seat, Bathroom Floor, Alternate

**Standard Epidemiological & Microbiological Methods were used**:
- Molecular methods are as follows:
  - DNA was extracted using the Qiagen DNA stool kit, DNA was quantified and purified.
  - Amplification and restriction of DNA was performed using the Qiagen DNA stool kit. DNA was amplified using the Qiagen DNA stool kit. DNA was amplified using the Qiagen DNA stool kit.
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**Duke University Hospital and Duke Regional Hospital participated in this study**

**Discussion**
- **Limitations**:
  - Single center experience and low numbers.
  - VRE isolates from a transmission event failed to amplify.
- **Conclusions**:
  - Detectable transfer of bacteria between patients and environmental surfaces occurs at least in 10 hospital admissions.
  - Pre-existing patient colonization, inadequate cleaning, and importation into room are sources of bacteria.
  - Of 40 patient admissions, 5 (12.5%) had epidemiologically-demonstrated TransFER events.
  - 3 of 4 TransFER events with molecularly-typable bacteria showed transmission of identical clone.